

NAVAL WAR COLLEGE
Newport, R.I.

FORTIFYING THE FOUNDATION OF COMBAT POWER:
NETWORK CENTRIC WARFARE AND PRINCIPLES OF LOGISTICS

by

Michael S. Paulk
Major, United States Marine Corps

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College, the Department of the Navy or the United States Marine Corps.

20000621 126

Signature: *Michael S. Paulk*

8 February 2000

William R. Spain
Colonel William R. Spain, USMC
Faculty Advisor

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

UNCLASSIFIED

Security Classification This Page

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): FORTIFYING THE FOUNDATION OF COMBAT POWER: NETWORK CENTRIC WARFARE AND PRINCIPLES OF LOGISTICS (Unclassified)			
9. Personal Authors: Michael S. Paulk, MAJ, USMC			
10. Type of Report: FINAL		11. Date of Report: 8 February 2000	
12. Page Count: 24		Admiral: COL Spain	
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC, the Department of the Navy or the United States Marine Corps.			
14. Ten key words that relate to your paper: Network-centric, centralized C2, decentralized execution, logistics, responsiveness, flexibility, sustainability, survivability.			
15. Abstract: The United States has within its reach the ability to prevail in any foreseeable conflict by virtue of its ability to see, comprehend, and control all aspects of the battlefield. This paper will evaluate, from a naval perspective, four of the seven principles of logistics, apply a network centric warfare approach, and review the positive implications of network centric warfare application. Furthermore, a review of the Department of the Navy's network centric warfare vision and the Joint Chiefs of Staff JV2010 vision with respect to logistics will be addressed. Although each principle of logistics is equally important, the application of network centric warfare to responsiveness, flexibility, sustainability, and survivability offers the greatest impact to the warfighter.			
16. Distribution / Availability of Abstract:	Unclassified X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-6461		20. Office Symbol: C	

Security Classification of This Page Unclassified

No one is thinking if everyone is thinking alike.

- General George C. Patton, USA

Introduction

As America enters the dawn of the 21st century, the United States military faces a dynamic, challenging and uncertain security environment. The National Command Authorities (NCA) articulated a three-core National Security Strategy to enhance our security, bolster America's economic prosperity, and promote democracy abroad.¹ The Chairman of the Joint Chiefs of Staff issued a conceptual template, Joint Vision 2010 (JV2010), addressing four, new operational concepts: Dominant Maneuver, Precision Engagement, Full Dimension Protection and Focused Logistics. JV2010 is the operational link to the National Security Strategy. Information superiority and technological innovation are the two critical enablers of Joint Vision 2010.² Taken together this series of visionary and doctrinal documents provide the framework from which America's Armed Forces will operate. The military desired end state is full spectrum dominance.³

By most accounts, we have entered the *Information Age* where information technology is replacing the machines and platforms of the Industrial Age as the driving economic and social force. This change in American society has challenged the United States military to embrace information technology and adapt our forces. Military leaders envision that the characteristics of the future battlefield will be increased operating ranges, coordinated speed of maneuver, and precision delivery of massed effect.⁴ However, adapting our military involves more than accepting new technology. It requires integrating the technology into military organization and doctrine. History

reflects this premise in the coupling of new technology and application with: Adolph Hitler's blitzkrieg; the British air defense of England; the introduction of United States aircraft carriers as force projection; and the advent of nuclear weapons. Each of these adaptations was driven by a willingness to experiment with new doctrine and force structures.⁵

Thesis

This paper will evaluate, from a naval perspective, four of the seven principles of logistics as set forth in Joint Pub 4-0, Doctrine for Logistic Support of Joint Operations, apply a network centric warfare approach, and review the positive implications of network centric warfare application. Furthermore, a review of the Department of the Navy's network centric warfare vision and the Joint Chiefs of Staff JV2010 vision with respect to logistics will be addressed. Although each principle of logistics is equally important, the application of network centric warfare to responsiveness, flexibility, sustainability, and survivability offer the greatest impact to the warfighter.

Network Centric Warfare

Knowing that achieving high levels of battlespace awareness and knowledge lies at the foundation of JV2010, network centric warfare is an excellent integrating tool for the warfighter. Utilization of network centric warfare will enhance the commander's ability to accomplish his objectives by focusing on the combat power that can be generated from the effective linking or networking of the warfighting force. Network centric warfare enhances the ability to develop and maintain battlespace awareness and knowledge by capitalizing on capabilities for collecting, processing, and transporting available information.⁶ Network centric warfare is about human and organizational behavior. This

warfare is based on adopting a new way of thinking – network centric thinking – and applying it to military operations. Network centric warfare supports speed of command – the conversion of superior information position to action. It is transparent to mission, force, size, and geography. Furthermore, network centric warfare has the potential to contribute to the coalescence of the tactical, operational, and strategic levels of war. Network centric warfare is not narrowly about technology, but broadly about an emerging military response to the Information Age.⁷ Finally, to operate in a network centric environment is not an *objective* or a goal of combat. Likewise, to operate network centricly is not a *strategy* for conducting combat. Rather, network centric warfare is a means to empower strategies to accomplish ends.⁸

Logistics Defined

In its abstract sense logistics, like strategy, tactics, economics, and politics, is not susceptible to a single simple and permanent definition. Several of the most useful and enlightening descriptions of abstract logistics – or pure logistics – are: “Logistics is all that part of war which is not included in Strategy and Tactics. Strategy and Tactics provide the scheme for the conduct of military operations: Logistics provides the means therefore,” Col. Thorpe, Pure Logistics.⁹ Logistics is the art and science of planning and carrying out logistics operations to support the protection, movement, firepower, and sustainment of operating forces.

One of the operational concepts of JV2010 is Focused Logistics. Focused Logistics is the fusion of logistics technologies for rapid crisis response; deployment and sustainment; the ability to track and shift units, equipment, and supplies even while en route; and delivery of tailored logistics packages and sustainment directly to the

warfighter. There are a host of possible interpretations of Focused Logistics, but each has a common frame of reference: the imperative of technological advantage; the need for faster, more reliable, integrated logistics systems; and instilling confidence in the warfighter that critical supplies will be in the right place, at the right time, and in the right quantity. The challenge is to reduce response times, order and ship times, inventories, and right-size the logistics footprint, while increasing support to the warfighter. The vision of Focused Logistics is improved support to the warfighter through increased responsiveness, visibility and accessibility of logistics resources. The desired end state is full spectrum supportability – complementing JV2010’s desired end state of full spectrum dominance.¹⁰

Logistics Principle of Responsiveness

Of the seven principles of logistics, responsiveness is the most crucial for all else becomes irrelevant if the logistics system cannot support the commander’s concept of operations. Joint Pub 4-0 states that responsiveness is “the right support in the right place at the right time.”¹¹ Planning at the strategic and operational levels must consider the responsive capabilities of the logistics elements. With a vision of centralized command and control coupled with decentralized execution, synchronization is a critical factor at the strategic and operational levels. It’s criticality lies in the execution phase. Moreover, self-synchronization is perhaps the ultimate in achieving increased tempo and responsiveness. Self-synchronization can take many forms in the warfighting environment. However, significant potential lies in the class of warfighting activities providing supporting services, such as logistics. Therefore, self-synchronization,

enhanced with network centric warfare, increases the logistics system's ability to support the warfighter.

One aspect network centric warfare will enable is total asset visibility. Total asset visibility will improve operational awareness of support, reduce logistics response time and permit logistics management by exception. Developments in Automatic Identification Technology (AIT) integrated into Automated Information Systems (AIS) and interface with industry will enhance automated tracking of assets throughout the world. A rapid air, sea, and land transportation system will enable us to reduce Logistics Response Time (LRT) and lead to a streamlined effective, efficient, and economical logistics system. Information fusion and transportation technology will enable the warfighter to replace mass with velocity and have the confidence required to make it work.¹²

Focused Logistics necessitates the development of intelligent, intuitive decision-support, planning tools that will permit logistics forces to be proactive vice reactive to the needs of the warfighter. Increased emphasis on precision in our logistics processes will have the effect of producing more capable forces when and where they are needed – a force multiplier.¹³ Examples of network centric warfare's ability to provide operational forces information concerning friendly, enemy, and neutral forces that can be integrated in a Common Operational Picture (COP) include: location (current positions, rate of movement, and predicted future movement); status (readiness postures including combat capability and logistics sustainability); and the environment (including current and predicted weather conditions, terrain features such as trafficability and sea conditions).¹⁴

The capabilities of COP provide operational forces a view of the battlespace. This capability will enhance the ability to plan, respond, and shape the area of operations.

The process of unit deployment manifesting can illustrate another example of network centric warfare capability to improve responsiveness and timeliness. To manifest 200 soldiers for air transport can take over 8 hours employing traditional techniques. During *Exercise Cobra Gold '98*, the use of smart-card technology and portable sensors enabled 200 soldiers to be manifested in 2 hours while the manifest information was loaded directly into the Global Transportation Network (GTN). Additional process changes have the potential to reduce the total manifest time to under an hour. The result is both accelerated deployment of troops and material and increased in-transit visibility. These network centric warfare results allow a unit to respond more quickly and increase tempo to the limit allowed by the logistics situation.¹⁵

The U.S. Marine Corps is developing a concept to improve command and control systems. IMMACCS (Integrated Marine Multi-Agent Command and Control System) incorporates three fundamental concepts that distinguish it from existing command and control applications. First, it is a collaborative system in which computer-based agents assist human operators by monitoring, analyzing and reasoning about events in near real-time. Second, IMMACCS includes an ontological model of the battlespace that represents the behavioral characteristics and relationships among real world entities such as friendly and enemy assets, infrastructure objects (e.g., buildings, roads, and rivers), and abstract notions. Third, IMMACCS provides no ready-made solutions that may not be applicable to the problems that will occur in the real world. Instead, the agents represent a powerful set of tools that together with the human operators can adjust

themselves to the problem situations that cannot be predicted in advance. In this respect, IMMACCS is an adaptive command and control system that supports planning, execution and training functions concurrently.¹⁶ IMMACCS, another example of a network centric warfare enabler, provides operational forces a COP and its potential to provide real-time Focused Logistics requirements make it a combat multiplier.

The U.S. Transportation Command's (USTRANSCOM) Joint Mobility Control Group (JMCG) is an integrated, state-of-the-art transportation requirements control center. Similar in concept to operations centers in today's cutting-edge global transportation companies, JMCG provides USTRANSCOM customers "one stop shopping" for all their transportation requirements. A fundamental principle of the JMCG is centralized command and control and decentralized execution, with visibility of all movement requirements available through emerging systems such as GTN and the World Wide Web (WWW). From a customer perspective, this new way of doing network centric warfare business, streamlines the mobility process while enabling USTRANSCOM to capitalize on the efficiencies inherent in consolidating functions and reducing redundancy.¹⁷

Focused Logistics integrates a host of initiatives designed to improve support to the warfighter. The success of the program will be determined by the extent to which the joint logistics community can pool its resources. The Joint Staff and the Services are currently evaluating the structure of a single in-theater joint logistics organization whose mission would be to synchronize, prioritize, direct, integrate, and coordinate common user and cross Service logistics functions. The goal of this Global Combat Support System (GCSS) is to provide universal access to information and interoperability of that information across Command Support (CS) and ultimately between support functions and

command and control. The end state is a secure, intranet environment allowing Department of Defense users to access shared data and applications, regardless of location, supported by a robust information infrastructure. This will result in near real-time command and control of the logistics pipeline; one fused picture of combat support to the warfighter; and a closed link between command and control and combat support during critical execution of an operation.¹⁸ America's military must continue the effort on the development of technology with logistics application and improved business practices designed to make our planning more effective and our logistics systems more responsive. Focused Logistics will ensure delivery of the precise amount and types of supplies required for our joint forces to succeed in combat or non-combat operations.¹⁹

Logistics Principle of Flexibility

Logistics plans and operations must be flexible in order to meet the support requirements of our operational forces. Joint Pub 4-0 states that flexibility is "the ability to adapt logistics structures and procedures to changing situations, missions, and concept of operations."²⁰ One may argue that the new strategic imperative is *quickness* and survival of the fittest is now survival of the fleetest. However, flexibility remains the key element for it is the ability to respond to change. Maximizing flexibility demands distributed information, simple decision rules, and mission-based orders.²¹ Combat in the future may involve smaller, more lethal forces with a greater amount of information on their enemy. Flexible, network centricly efficient logistics systems will sustain those forces, including support from the coastal littorals. Joint Logistics Over-the-Shore (JLOTS) forces will support these smaller combat forces with mobile logistics; moving munitions, food, water, and fuel along the coastal plain. Sustainment supplies will arrive

via utility landing craft and logistics support vessels from ships located over the horizon.²² Network centric warfare's capability to provide near real-time information on a COP will allow operational forces to make continuous in-stride adjustments and changes to the on-going operation. Therefore, it is paramount for logistics plans and operations to be flexible.

The U.S. Marine Corps capstone operational warfighting concept for the 21st Century, Operational Maneuver from the Sea (OMFTS), offers the promise of extraordinary leaps in operational flexibility by introducing the notion of enhanced capabilities for sea-based logistics. Sea-basing allows greater operational initiative and flexibility, as forces will be liberated from establishing large, shore based, logistics depots.²³ This concept, Seabased Logistics, will reduce the time required for reconstitution by retaining substantial command and control, and logistics forces afloat throughout an operation. The tenets of Seabased Logistics (sea base primacy, demand reduction, in-stride sustainment, adaptive response and joint operations capable, ability to close and reconstitute forces at sea) employ improved logistics tactics, techniques, and procedures to deliver flexible, highly responsive support for future naval and joint operations.²⁴

Network centric warfare will allow America's military to link-up with commercial industry. America's military force can learn valuable lessons from successful American companies in many areas, including networking and information management, incorporation of new and advanced technologies, and logistics integration. Outsourcing and privatization are being pursued as integral elements of a comprehensive strategy to introduce greater competition into logistics business areas, eliminate inefficient duplications between Department of Defense and industry, and take maximum advantage

of commercial business practices. The result will be improved performance and an unrivaled support structure. These efforts must be synchronized with warfighter requirements while seeking greater efficiencies.²⁵ Network centric warfare capabilities from commercial fields in areas such as Electronic Commerce (EC), Electronic Data Interchange (EDI), and AIT have played major roles in reinventing logistics operating procedures. Successful adoption of commercial business practices have resulted in reduced inventories, improved productivity, increased flexibility, and improved readiness.

Network centric warfare possesses the enablers to reduce and eliminate Service redundancies. Current logistics operations are independent and very compartmentalized among the U.S. military services. If each service takes advantage of network centric warfare by applying the advances in information technology, the risk of inefficient redundancies and reduced advantages in planning and operations will occur. JV2010 challenges America's military to increase joint operations; and consolidate support operations and force enhancers such as logistics, intelligence, communications, and medical services. This consolidation effort will improve joint logistics planning and operations by offering flexibility to the process. An example of this flexibility to the operational forces may be a notional area of operations where logistics capabilities are under a Joint Theater Logistics Management (JTLM) concept. JTLM is created utilizing the Joint Force Air Component Commander (JFACC) structure employing centralized command and control with decentralized execution. JFACC responsibilities normally include planning, coordination, allocation, and tasking based on the joint commander's

apportionment decision. JTLM would provide the warfighter an integrated logistics picture of the battlespace.

Victory will come only with our ability to organize our resources, and those other world resources which we can command through allies and friendship, in the most effective way.²⁶ The logistics principle of flexibility, enhanced by the tools of network centric warfare, will ensure America's resources are organized for maximum exploitation by our operational forces.

Logistics Principle of Sustainability

Long-term sustainment is the critical challenge for our operational forces. Joint Pub 4-0 states that sustainability is "a measure of the ability to maintain logistic support to all users throughout the theater for the duration of the operation."²⁷ Increased visibility and accessibility of the battlespace, provided by network centric warfare capabilities, will allow operational forces to remain abreast of current and future logistics sustainment operations. JV2010 directs that our military forces migrate from a supply to a distribution-based sustainment system. America's military must produce support systems that will be far more visible, reliable, and accessible. JV2010's Focused Logistics details a network centric warfare concept that improves sustainment.

The Theater Distribution (TD) concept includes a combat support initiative to improve distribution operations in force projection theaters. The essential characteristics of TD include centralized distribution management encompassing the best commercial business practices, reduction in the layering effect of current supply operations, improved Combat Service Support (CSS) communication flow, near real-time asset visibility, and a modular theater operating force package. Current technologies include Joint Total Asset Visibility

(JTAV), Intransit Visibility (ITV), AIT, and Movement Tracking Systems (MTS). TD establishes distribution as a discipline. The concept synchronizes material and movement management at all levels in a theater of operations, ensuring optimal utilization of transportation resources. TD concept focuses on force projection operations from the initial deployment of units and material through the sustainment phase, to retrograde and redeployment.²⁸ This concept capitalizes on the vision of centralized command and control with decentralized execution.

Federal Express offers an outstanding example of an organization that understands the value of the logistical principle of sustainment. Federal Express delivers over 2.1 million packages a day, guaranteed. The company operates in 211 countries, at 325 airports and has a fleet of 200 aircraft. Federal Express' ability to fuse information, command and control their fleet of aircraft and personnel, and react to system failures is central to their ability to succeed in business. Federal Express has a philosophy of centralized command and control with decentralized execution. The company's central hub is located in Memphis, Tennessee with over 1400-service centers throughout the United States. Federal Express utilizes state-of-the-art information technology with human involvement. Located at the hub in Memphis is the company's central mainframe computer system – COSMOS. COSMOS and the Federal Express Support Center provide real time information to all operators in the field. The Federal Express employees input data to COSMOS and the Support Center through the Digital Assisted Device (DAD). Those same field operators can access all the information required, such as package location, aircraft availability, vehicle status, weather, and system breakdowns through a computer program – Supertracker. The Support Center is active twenty-four hours a day, seven

days a week and continually updates the information from the field operators. This system is a solid illustration of how network centric warfare may apply to the logistics planning and execution phases for the warfighter.

The U.S. Marine Corps concept of Seabased Logistics proposes four key changes to sustainment: elimination of the traditional force beachhead; reduction of logistics demand; implementation of stride sustainment; and transition to sustained operations ashore.²⁹ Seabased Logistics is the indefinite sustainment of forces ashore from a sea-based platform. A primary enabler will be the coupling of seabased ship to objective distribution with network-based, automated logistics information to provide *in-stride sustainment* for maneuvering and fighting naval expeditionary forces. The primacy of seabasing will be its ability to build, project, and sustain combat power. Seabased Logistics will employ an integrated over-the-horizon floating distribution center providing indefinite sustainment. While primary fighting forces will carry initial support requirements, the sea base will provide credible long-term sustainment.³⁰

Network centric warfare will provide highly automated requisition and distribution management systems that will reduce human input, accelerate material movement and reduce costs. Aggressive application of compatible commercial technologies will be used to anticipate demand. Instead of vast quantities of material being pushed forward, end-users will communicate consumption data that will pull tailored support to maneuver units. The highly automated nature of *anticipated pull* logistics will allow a management by exception approach. This will allow lower levels of inventory and better sustainment response.³¹ Network centric warfare offers the warfighter the capability to have indefinite logistic support throughout the theater for the duration of the operation.

Logistics Principle of Survivability

The warfighter is constantly aware of the critical requirement to safeguard logistics bases and operations. Joint Pub 4-0 states that survivability is "the capacity of the organization to prevail in the face of potential destruction."³²

The Information Age brings an entirely new dimension of protection to our military leaders. The cyberspace revolution is both our essential enabler and our critical vulnerability. Military logistics and routine communications systems rely extensively on the public telecommunications grid, the domestic electric grid, and domestic transportation systems; each are dependent on potentially vulnerable computer networks. During future crises, the United States must expect significant Computer Network Exploitation (CNE) and Computer Network Attack (CNA) activity against both our military and civilian infrastructures.³³ Network centric warfare must apply protection towards these vulnerabilities.

As stated previously, OMFTS includes the function of Seabased Logistics. Seabased Logistics greatly reduces a force's "footprint" and therefore its ashore vulnerability. Operational forces will be liberated from providing rear area security to protect Seabased Logistics. Seabased Logistics displaces the vulnerability location from the shore to the sea. Furthermore, the concept of seabasing will provide the warfighter with the capability to maneuver combat forces seamlessly from the sea to the decisive objective area without the traditional impediment of securing the beach. Seabasing thus allows putting the "teeth" ashore while leaving the logistics "tail" afloat.³⁴ Operational forces will no longer be required to protect massive logistics bases and extensive interior lines of communication. This concept does not completely remove the potential threat on

hostile attack against an operational logistics base for the force's material remains vulnerable at sea. However, Seabased Logistics will require a hostile force to plan an attack utilizing a different form of tactics than employed against an ashore logistics base. The hostile force would probably strike a critical vulnerability – an indirect tactic to defeat our operational forces. Seabased Logistics is based on the ability to maneuver at sea. Operational maneuver is supported through the function of command and control. The command and control function is supported by information systems. Network centric warfare links the information systems together to provide the warfighter a single, integrated information asset. This single source information asset may be an excellent critical vulnerability for a hostile force to attack. The vulnerability exists due to the current inability to protect assets linked to computer networks.

Vulnerabilities

As America's military adapts to the Information Age complex information systems will be vulnerable to attack. The rapid implementation of new technology could outpace the warfighter's ability to protect vital systems such as logistics. Furthermore, reliance upon network centric warfare and computer network makes our operational forces vulnerable to attack by organized groups, countries, multinationals, and intelligence organizations. These organizations could strike at the warfighter's logistics capabilities, severing the logistics principles of responsiveness, sustainability, and survivability. Meaconing, Intrusion, Jamming, and Interception (MIJI) are developed and practiced capabilities among potential hostile forces. The warfighter must be aware that network centric warfare systems are highly susceptible to attack. Operational forces can expect a

potential hostile force to utilize information warfare (IW) as an inexpensive means to attack a critical vulnerability or center of gravity.

A Third-world nation can procure a formidable, modern IW capability off the shelf. With this potential arsenal of computer network weaponry, even marginal opponents can attack a superpower that no longer can be challenged with conventional weapons. Operational forces must protect against a potential foe's capability to cause significant disruption to our information systems and, in turn, cripple operational readiness and military effectiveness. Potential hostile forces may inflict damage on information or information systems vital to our operational forces from virtually any location. A computer network attack is an excellent method to overcome the disparity in conventional forces and neutralize the United States. Such attacks could degrade the warfighter's ability to make sound and timely decisions, prevent sustainment of logistical material, change critical data, or shut down entire networks.

During the recent exercise Eligible Receiver, the Red team Computer Network Attack (CNA) cell conducted numerous strikes on the Blue force's computer network systems. The Red team's CNA attempts were extremely successful and are indicative of the vulnerabilities in the infrastructure. There is no such thing as a 100 percent secure computer information network system. Network centric warfare brings the element of risk to the operational forces. It is important that America's military never "assume away" the vulnerabilities inherent with information network systems. The warfighter must ensure his forces employ an aggressive Computer Network Defense (CND) to minimize network centric warfare vulnerabilities. The vulnerability will always exist for it is impossible to protect everything connected to a computer network.

Conclusion

Operating in an environment characterized by rapid change and chronic, extreme levels of uncertainty is an environment on the edge of chaos. However, it can also be an environment full of opportunities, where the future may be defined. Responding to that environment effectively at the operational level requires consideration of essential force capabilities, command and control, and support services. Today, America's military is not prepared to leap into the total vision of network centric warfare where decentralized command and control and decentralized execution are applied. However, our warfighters must take the first step, applying network centric warfare to significantly increase the capabilities of the operational forces and enhance centralized command and control along with decentralized execution. In assessing the future, it is important to remember that logistics is still the activity that underwrites sustainment, operational reach, massing of combat effects, and mission accomplishment.³⁵ The vision of Focused Logistics is improved support to the warfighter through increased responsiveness, visibility and accessibility of logistics resources. The desired end state is full spectrum supportability.

The preservation of our country is the government's ultimate responsibility. Anything less than the most effective mobilization and control of the country's entire resources for the prosecution of war will be the measure of the government's failure to live up to that responsibility.³⁶

The United States has within its reach the ability to prevail in any foreseeable conflict by virtue of its ability to see, comprehend, and control all aspects of the battlefield. Tomorrow's threat will be far more difficult to manage than yesterdays. Furthermore, as long as war involves humans, no technology can completely eliminate friction, ambiguity, uncertainty, and the fog of war thereby ensuring that a military organization

will function at 100 percent efficiency. Ultimately, our National Security Strategy and our vital interests will not be assumed by technology alone. We must develop capabilities to respond to a broad range of crises and conflicts. Our forces must be able to handle those things that technology alone cannot solve. By proper application of both the "science" and "art" of war we will ensure success on the battlefields of the future.³⁷ The application of network centric warfare to responsiveness, flexibility, sustainability, and survivability offers the greatest impact to the warfighter and fortifies the foundation of combat power.

NOTES

- ¹ The White House, A National Security Strategy for a New Century, October 1998, iii.
- ² Chairman of the Joint Chiefs of Staff, Joint Vision 2010 (Washington DC: Government Printing Office, n.d.), 1-2.
- ³ David S. Alberts and others, Network Centric Warfare: Developing and Leveraging Information Superiority (Washington DC: CCRP, 1999), 54.
- ⁴ U.S. Marine Corps Combat Development Command and U.S. Naval Doctrine Command, Seabased Logistics, A 21st Century Warfighting Concept (Quantico VA: May 12, 1998), 1.
- ⁵ William A. Owens, "Revolutionizing Warfare," The New Democrat Blueprint: Ideas for a New Century (Washington DC: Democratic Leadership Council, 1999), 24-26.
- ⁶ Alberts, Network Centric Warfare, 133.
- ⁷ Ibid., 88.
- ⁸ Arthur K. Cebrowski, "Network-centric Warfare: An Emerging Military Response to the Information Age," Speech, U.S. Naval War College, Newport, RI: June 29, 1999.
- ⁹ Henry E. Eccles, "Logistics – What Is It?" Technical Report Series: No.1, May 1989, 645-646.
- ¹⁰ U.S. Joint Chiefs of Staff, Focused Logistics (Washington, DC: Government Printing Office, n.d.), i-iii.
- ¹¹ U.S. Joint Chiefs of Staff, Doctrine for Logistic Support of Joint Operations (Joint Pub 4-0) (Washington, DC: Government Printing Office, 1995), II-1.
- ¹² U.S. Joint Chiefs of Staff, Focused Logistics, iii.
- ¹³ Ibid., iv.
- ¹⁴ Alberts, Network Centric Warfare, 133-135.
- ¹⁵ Ibid., 183.
- ¹⁶ Jens Pohl and others, IMMACCS: A Multi-Agent Decision-Support System (San Luis Obispo, CA: CAD Research Center, August 1999), 1-2.
- ¹⁷ U.S. Transportation Command, "Understanding the Defense Transportation System," USTRANSCOM Handbook 24-2 (Scott Air Force Base, IL: October 1, 1998), 15.

-
- ¹⁸ U.S. Joint Chiefs of Staff, Focused Logistics, 16-24.
- ¹⁹ Chairman of the Joint Chiefs of Staff, Joint Vision 2010, 26.
- ²⁰ U.S. Joint Chiefs of Staff, Logistic Support of Joint Operations, II-1.
- ²¹ Paul J. Reason and David G. Freymann, Sailing New Seas: Newport Paper Number Thirteen (Newport, RI: U.S. Naval War College, March 1998), 11.
- ²² U.S. Joint Chiefs of Staff, Focused Logistics, 10.
- ²³ U.S. Marine Corps, Concepts and Issues: Winning in the 21st Century (Washington, DC: Headquarters, U.S. Marine Corps, 1999), 33.
- ²⁴ U.S. Marine Corps and U.S. Navy, Seabased Logistics, 6-9.
- ²⁵ U.S. Joint Chiefs of Staff, Focused Logistics, 35.
- ²⁶ Hawthorne Daniel, For Want of a Nail: The Influence of Logistics on War (New York: Whittlesey House 1948), ix.
- ²⁷ U.S. Joint Chiefs of Staff, Logistic Support of Joint Operations, II-2.
- ²⁸ U.S. Joint Chiefs of Staff, Focused Logistics, 14-15.
- ²⁹ U.S. Marine Corps, Concepts and Issues, 36.
- ³⁰ U.S. Marine Corps and U.S. Navy, Seabased Logistics, 1-3.
- ³¹ Ibid., 5.
- ³² U.S. Joint Chiefs of Staff, Logistic Support of Joint Operations, II-2.
- ³³ Arthur K. Cebrowski, "CNE and CNA in the Network Centric Battlespace; Challenges For Operators and Lawyers," Speech, U.S. Naval War College, Newport, RI: June 22, 1999.
- ³⁴ U.S. Marine Corps, Concepts and Issues, 33.
- ³⁵ Paul Romanski, "Navy Logistics," Naval Operations Course, U.S. Naval War College, Newport, RI: August 1999, 16.
- ³⁶ Daniel, For Want of a Nail, viii.
- ³⁷ U.S. Marine Corps, Concepts and Issues, 39.

SELECTED BIBLIOGRAPHY

- Alberts, David S., John J. Garstka, and Frederick P. Stein. Network Centric Warfare: Developing and Leveraging Information Superiority. Washington, DC: CCRP, August 1999.
- Brewin, Bob. "DoD Lays Groundwork for Network-Centric Warfare." Federal Networks: Building the Infrastructure for the 21st Century. n.p.: FCW Government Technology Group, November 1997. <http://spica.or.nps.navy.mil/netusw/Net-Centric_article.html> (December 9, 1999).
- Cebrowski, Arthur K. "CNE and CNA in the Network Centric Battlespace; Challenges For Operators and Lawyers." Speech. U.S. Naval War College, Newport, RI: June 22, 1999. <<http://www.nwc.navy.mil/pres/speeches/Computer%20Network%20Attack%20Speech.htm>> (December 8, 1999).
- _____. "Network-centric Warfare: An Emerging Military Response to the Information Age." Speech. Command and Control Research and Technology Symposium, Newport, RI: June 29, 1999. <http://www.nwc.navy.mil/pres/speeches/ccrp2_.htm> (December 8, 1999).
- _____, John J. Garstka. "Network-Centric Warfare: Its Origin and Future." United States Naval Institute Proceedings, January 1998, 28-35.
- _____, Wayne P. Hughes, Jr. "Rebalancing the Fleet." United States Naval Institute Proceedings, November 1999, 31-34.
- Chairman of the Joint Chiefs of Staff. Joint Vision 2010. Washington DC: Government Printing Office. n.d.
- Chelberg, Robert D., Jack W. Elertson, David H. Shelley. "EUCOM – At the Center of the Vortex." Field Artillery, October 1993, 12-16.
- Daniel, Hawthorne. For Want of a Nail: The Influence of Logistics on War. New York: Whittlesey House, McGraw-Hill Book Company, 1948.
- Eccles, Henry E., "Logistics – What Is It?" Technical Report Series: No. 1. The Rear Admiral Henry E. Eccles Institute for Military and Logistics Analysis, May 1989.
- Gladwell, Malcolm. "Clicks & Mortar." The New Yorker, December 6, 1999, 106-115.
- Gompart, David C., Richard L. Kugler, Martin C. Libicki. Mind the Gap: Promoting a Transatlantic Revolution in Military Affairs. Washington DC: National Defense University Press, 1999.

Husted, Bill. "Technology of the Century." The Atlanta Journal-Constitution, December 26, 1999, pp. C:4-7.

"Joint Warfighting Science and Technology Plan." February 1998. Defense Science and Technology Strategy and Plans. n.p.: Department of Defense Director, Defense Research and Engineering, February 1998.

Kunzweiler, W.R. Strategic Mobility and Sealift in Support of Maritime Operations. U.S. Naval War College, Newport, RI: U.S. Naval War College, August 1999.

_____. "Strategic Mobility and Sealift in Support of Maritime Operations." Operations Session II-13, Joint Maritime Operations Course. U.S. Naval War College, Newport, RI: 17 December 1999.

Leopold, George. "Networks: DoD's First Line of Defense." Electronic Engineering Times, October 13, 1997. <<http://www.techweb.com/wire/news/1997/10/1013dod.html>> (December 9, 1997).

Macksey, Kenneth. For Want of a Nail: The Impact on War of Logistics and Communications. London; Washington, DC: Brassey's (U.K.), 1989.

Metcalf, Joseph III. "Decision Making and the Grenada Rescue Operation." Ambiguity and Command: Organizational Perspectives on Military Decision Making. n.p.: Harper Business, 1986, 277-297.

Nunn, Sam. "Get Ready for Cyberwar." The New Democrat Blueprint: Ideas for a New Century. Washington, DC: Democratic Leadership Council, 1999, 34-39.

Owens, Mackubin T. "The Use and Abuse of 'Jointness'." Marine Corps Gazette. Quantico, VA: Marine Corps Association, November 1997, 50-59.

Owens, William A., "Revolutionizing Warfare." The New Democrat Blueprint: Ideas for a New Century. Washington, DC: Democratic Leadership Council, 1999, 24-28.

Pohl, Jens, Mark Porczak, Kym Jason Pohl, Russel Leighton, Hisham Assal, Alan Davis, Lakshmi Vempati, Anthony Wood. IMMACCS: A Multi-Agent Decision-Support System. San Luis Obispo, CA: CAD Research Center, August 1999.

Reason, Paul J., David G. Freymann. Sailing New Seas: Newport Paper Number Thirteen. Newport, RI: U.S. Naval War College, March 1998.

Romanski, Paul. "Navy Logistics." Session 2B, Naval Operations Course. U.S. Naval War College, Newport, RI: U.S. Naval War College, August 1999.

Schoch, Bruce P. "Logistics of the Falklands War." Army Logistician. May-June 1986, 2-7.

- Seal, Tom. "Concept Development in the Marine Corps." Lecture. U.S. Naval War College, Newport, RI: January 12, 2000.
- Snyder, Thomas J., Stella T. Smith. "The War in the Persian Gulf." Air Force Journal of Logistics, Volume XXII, Number 2, 16-28.
- Stein, Fred P., "Observations on the Emergence of Network Centric Warfare." Command and Control Research & Technology Symposium Proceedings. Vienna, VA: Evidence Based Research, Inc., June 1998. <<http://www.dodccrp.org/steinncw.htm>> (December 9, 1999).
- Thorpe, George C. Pure Logistics: The Science of War Preparation. Newport, RI: Naval War College Press, 1997.
- U.S. Joint Chiefs of Staff. Doctrine for Joint Operations. (Joint Pub 3-0) Washington, DC: Government Printing Office, February 1, 1995.
- U.S. Joint Chiefs of Staff. Doctrine for Logistic Support of Joint Operations. (Joint Pub 4-0) Washington, DC: Government Printing Office, January 27, 1995.
- U.S. Joint Chiefs of Staff. Doctrine for the Defense Transportation System. (Joint Pub 4-01) Washington, DC: Government Printing Office, June 17, 1997.
- U.S. Joint Chiefs of Staff. Focused Logistics. Washington, DC: Government Printing Office, n.d.
- U.S. Marine Corps. Concepts and Issues: Winning in the 21st Century. Washington, DC: Headquarters, U.S. Marine Corps, 1999.
- U.S. Marine Corps Combat Development Command, U.S. Naval Doctrine Command. Seabased Logistics, A 21st Century Warfighting Concept. Quantico, VA: May 12, 1998. <<http://www.concepts.quantico.usmc.mil/sbl.htm>> (December 9, 1999).
- U.S. Transportation Command. "Understanding the Defense Transportation System." USTRANSCOM Handbook 24-2. Scott Air Force Base, IL: October 1, 1998, 1-20.
- Webb, George S. "The Razor's Edge: Identifying the Operational Culminating Point of Victory." Unpublished Research Paper, U.S. Naval War College, Newport, RI: Naval War College, May 16, 1995.
- The White House. A National Security Strategy for a New Century. Washington DC: Government Printing Office, October 1998.
- Vego, Milan. On Operational Art. Newport, RI: U.S. Naval War College, September 1999.